

Applicability of the Department of Labor's O*NET for Army Occupational Analysis

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APPLICABILITY OF THE DEPARTMENT OF LABOR'S O*NET FOR ARMY OCCUPATIONAL ANALYSIS

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APPLICABILITY OF THE DEPARTMENT OF LABOR'S O*NET FOR ARMY OCCUPATIONAL ANALYSIS

I. Applications of Occupational Analysis

Downsizing has significantly affected the number of training seats needed for several Military Occupational Specialties (MOS). MAJ Jones in the Training Development Branch needs to revise the training curriculum to be more efficient (e.g., combine classes, revise classes). MAJ Jones hopes to accomplish this by identifying knowledge and skills common to several MOS and developing general training for them.

Mr. Tkachenko wants to know whether his school is providing trainees with the skills they need to perform their jobs.

A new weapons system is in development. Ms. Boone needs to determine how to select and train personnel to operate and maintain the system.

COL Asbury needs to assemble a special operations team for a mission in Saudi Arabia. The mission will involve training a small cadre of Saudi officers in mission planning for direct action missions. For this mission he needs U.S. Army officers who speak Arabic, are excellent mission planners, have experience on direct action missions, are highly knowledgeable about air-land battle, and are good teachers and diplomats.

MG Han has tasked his proponent office to recommend what new MOS are needed and how tasks should be distributed across MOS. The staff needs a decision tool to model alternative MOS structures based on data.

The 99Q MOS is being combined with the 99C and 99D MOS. Mr. Alcott needs to determine the training requirements for this merger.

Juan Vassos is a high quality applicant who wants a job that combines his interests in electronics and outdoorsman activities (fishing, hunting) and provides post-

military work opportunities. He is bilingual, speaking Spanish and English fluently. The recruiter, SGT Johnson, needs to find the MOSs that best match Juan's abilities and interests.

A warrant officer, Keesha Gray, is an excellent rotary wing aircraft pilot. Unfortunately, her mother in Chicago is very ill, and there are no other family members to take care of her. Ms. Gray will need to take a hardship discharge if she cannot take an Army job that moves her to the Chicago area.

SFC Padrino is about to retire from a combat support MOS. He needs to find a civilian job that makes use of his training, knowledge, and skills.

A host of manpower, personnel and training (MPT) functions rely on occupational analysis data or could use occupational analysis information for data-centered decision making. The preceding hypothetical scenarios illustrate MPT needs in several areas:

- Manpower Planning,
- Recruiting,
- Placement/Classification,
- Course Development and Evaluation,
- Relocation/Transfer,
- Mission Staffing, and
- Outplacement.

The scenarios hint at features of an ideal occupational analysis system. For example, in the first scenario

Downsizing has significantly affected the number of training seats needed for several MOS. MAJ Jones in the Training and Development Branch needs to revise the training curriculum to be more efficient (e.g., combine classes, revise classes). MAJ Jones hopes to accomplish this by identifying knowledge and skills common to several MOS and developing general training for them.

MAJ Jones has a set of MOS, probably a list of MOS-specific tasks, and MOS-specific training curricula. To design courses that cut across MOS, MAJ Jones needs to know how important various knowledges and skills are in each MOS. The knowledges and skills must be described in a common language across MOS.

Several of the other scenarios suggest that using a common language to describe knowledges and skills across MOS could be an important feature of an occupational analysis system. Some other aspects suggested by the scenarios are:

- Multiple types of descriptors (e.g., specific tasks, cross-functional skills, knowledges) are needed to meet the wide array of demands.
- Job incumbents, MOS, and training curricula should be described in terms of common descriptors to facilitate matching people with assignments or training.
- Occupational analysis data need to be current and easily accessible.
- The occupational analysis database needs to be linked to several other databases, such as a database of position openings, a database of civilian occupations, and a database of training courses.

The remaining sections of this report analyze the Army's needs for occupational analysis based on current events, explain how the Department of Labor's O*NET is relevant to those needs, and describe a way to develop the Army Personnel Network (AP*NET) by extending O*NET to the Army.

II. The Role of Occupational Analysis in The Army of 2010

Occupational analysis is the essential building block for virtually every aspect of Manpower, Personnel, and Training (MPT). But today's Army is in transition. Dynamic strategic and technological environments are reshaping the Army's missions, size, structure, technology, and available resources (Department of the Army, 1994; Gorman, 1995; Toffler & Toffler, 1993; Waller, 1995). Indeed some suggest that the Information Age is bringing a paradigm shift to warmaking and peacekeeping in the twenty-first century (Defence Technology, 1995).

What role will occupational analysis play in the Army of 2010? Analysts planning for Force XXI predict several types of transition for the next few decades:

- changing missions,
- tailoring units to missions,
- developing new technology and weapons systems,
- changing battle command,
- emerging information technology,
- ongoing rapid change.

Each type of transition has implications for the Army's MPT system, and in turn, those implications define desirable qualities for the Army's future occupational analysis system. Table 1 outlines those changes.

Table 1.

Implications of Anticipated Changes in the Army for MPT and Occupational Analysis Systems

Anticipated Change	Implications for MPT Systems	Implications for Occupational Analysis
Changing missions	Must address interpersonal, cross-cultural, and other non-technical knowledges, skills and abilities in selection and training.	Include descriptors for interpersonal and other non-technical knowledges, skills, and abilities.
Tailoring units to missions	Must provide information for rapid team formation.	Describe jobs, people, and missions in a common language.
Developing new technology and weapons systems	Must enhance transfer of training across jobs and specific pieces of equipment.	Include descriptors of broad technological skills.
Changing battle command	Must select soldiers who are adaptable. Must ensure that soldiers have needed decision making, teamwork, and problem-solving skills.	Include descriptors for decision making, teamwork, and problem-solving skills.
Emerging information technology	Must realize that MPT information can become a part of the battle.	Include descriptors useful to commanders in the database. Develop policies and controls for use.
Ongoing rapid change	Must be continually updated and accessible.	Take advantage of automation and on-line services. Develop future-oriented job analysis approach.

Changing Missions

The Army envisions more Joint, Multinational, and Coalition Warfare, a greater emphasis on Operations Other Than War (OOTW), and increasing the proportion of missions in low intensity conflict. Such missions reflect two trends relevant to MPT--an emphasis on small unit operations and greater interaction with soldiers and people from other countries.

Research on Special Forces jobs suggests that OOTW and coalition missions require attention to non-technical job tasks such as building rapport with indigenous people and teaching or working side-by-side with other nations' forces (Russell, Crafts, Tagliareni, McCloy, & Barkley, 1994). Moreover, MPT systems in the future will have to address non-technical skills. Force XXI soldiers may need training in languages, area studies, interpersonal skills, teamwork, conflict resolution, intercultural communication, and world history to operate in a wider array of missions. Importantly, the occupational analysis system will need to capture non-technical job tasks and define the knowledges, skills, and abilities associated with them.

Tailoring Units to Missions

The Army describes how "rapidly tailoring units to missions will be increasingly possible because of the growing ability to share and move information rapidly among ... soldiers, leaders, and units" (Department of the Army, 1995, p. i). For example, a commander might be able to select several units to perform a mission or several individuals to form a team for a mission. This requires task-based data for matching units and perhaps individuals to the requirements of the mission. One way to accomplish this is to develop two (or more) linked databases. One database would contain current data on individuals' (or units') skills, abilities, and availability. Another database would link those skills and abilities to tasks or functions *organized by mission*. The commander using the system would check-off or select key functions to be accomplished, and the database would provide a list of available individuals or units that are well-suited to the mission. Such a system would require developing a common language to describe people, jobs, and *missions*.

Developing New Technology and Weapons Systems

One key Force XXI concept is that as the world enters the Information Age technological advances will surge forward (Department of the Army, 1994; Toffler & Toffler, 1993). Rapid advances create problems for a training system that focuses on training individuals specifically on one piece of equipment or for one job. Such training is not readily transferable across jobs.

Army training will need to redesign itself in a way that facilitates skill transfer across jobs and types of technology--to focus on cross-functional knowledges and skills. For example, *knowledge of electronic principles* would be a cross-functional knowledge applicable to a wide range of jobs. Early stages of training would focus on cross-functional skills and later stages would emphasize specific weapons/equipment. Occupational analysis would need to define knowledges and skills at two levels (cross-functional and job-specific).

With regard to personnel selection, research suggests that the Army will need to select *adaptable* soldiers (Rumsey, 1995)--soldiers who can shift gears and adapt to change in work. Occupational analysis can be used to evaluate the need for adaptability in different Army jobs.

Changing Battle Command

The Army expects to grow flatter and less rigidly hierarchical as information technology advances. Decision making is expected to become less authoritative. Increasing the level of responsibility and authority given to individuals, and asking individuals to make decisions in a team (rather than through the hierarchy), will place new demands on the selection and training systems. The Army will need to ensure that individuals have the decision making, problem-solving, and teamwork skills needed to meet these new demands. The occupational analysis system will need to include descriptors for these skills and facilitate gathering information on them.

Emerging Information Technology

Emerging information technology is shifting the paradigm of war (Defence Technology, 1995). Waller (1995) describes a future battle:

... a computer virus is inserted into the aggressor's telephone-switching stations, causing widespread failure of the phone system. Next, computer logic bombs, set to activate at predetermined times, destroy the electronic routers that control rail line and military convoys, thus misrouting boxcars and causing traffic jams. Meanwhile, enemy field officers obey the orders they receive over their radios, unaware the commands are phony. Their troops are rendered ineffective as they scatter through the desert (p. 39).

Information warfare (psychological operations) is not new; but its reach along the information highway is becoming vast. Indeed MPT or occupational analysis information traditionally used in support of readiness can now become part of the battle. Occupational analysis data could be used by our own commanders to make decisions about assignments. Such data could also be a target for enemy sabotage or reconnaissance attempts. The important point here is that occupational information could be used much differently in the future if it were accessible and included descriptors that were useful to military commanders.

Ongoing Rapid Change

The overarching principle of Force XXI concepts is that technology and missions will rapidly change (Department of the Army, 1994). The pace of change will make it difficult to maintain current data and make the data accessible in time for use.

Rapid change has two specific implications for the Army's occupational analysis system. First, the occupational analysis system will need to capture and update changes in tasks, knowledges, and

skills quickly and accurately. Automation and on-line services will be essential to enhance the timeliness, accessibility, and quality of occupational information.

Second, the occupational analysis system must be future-oriented. What missions will the Army handle in the future? What new technology will the Army be using? What tasks will personnel need to be able to do to perform new missions and to use new technology? How should tasks be assigned to jobs or functions? How should people be selected for the new jobs? The occupational analysis system must facilitate planning MPT requirements for new jobs. This means conducting job analysis as jobs are being conceptualized, created, or changed. Proponent offices could, for example, review a list of job descriptors and indicate what knowledges, skills, abilities, and so on would be needed for the new job.

III. Characteristics of an Ideal Army Occupational Analysis System

The ideal Army occupational analysis system would be used by MPT professionals and perhaps Army commanders in the Army of 2010. Its linked databases would allow easy access to descriptions of training courses that teach a particular skill, to lists of soldiers who have skills and abilities relevant to a particular type of mission, to Army jobs that have similar requirements, and so on. It would have a menu-driven, user-oriented interface that allows users to access data at the level of aggregation and specificity that is best suited to the application.

Characteristics

The characteristics of an ideal Army occupational analysis system can be derived from anticipated MPT applications. Table 2 summarizes MPT applications based on the anticipated changes for the Army of 2010 previously discussed and defines a system characteristic relevant to each application. For example, the characteristic--*includes descriptors for a wide range of person attributes*--is intended to address the MPT application--*to facilitate development of training and selection for future missions and for a more lateral organization*. That application was suggested by the Army's expectation for greater emphasis on OOTW and joint missions.

Table 2.

Characteristics of an Ideal Army Occupational Analysis System

Characteristic	MPT Application
Uses a common language.	To allow for comparisons across jobs. To allow linkages among databases describing jobs, people, and training.
Includes descriptors for a wide range of person attributes (e.g., interpersonal, problem solving).	To facilitate development of training and selection criteria for future missions (e.g., OOTW) and for a more lateral organization.
Includes descriptors for general work activities, skills, and knowledges that are relevant across jobs.	To facilitate development of cross-job (transferable) training courses.
Includes occupation-specific descriptors (e.g., specific tasks, equipment, and technology).	To facilitate development of recruiting materials, occupation specific training, and technology-oriented materials.
Includes descriptors at varying levels of specificity arranged hierarchically.	To enhance usefulness to a diverse set of users.
Includes a taxonomy of missions and linkages among missions, work activities, skills, and knowledges.	To allow for mission-specific planning.
Includes variables or aggregates of variables likely to be useful to commanders.	To enhance usefulness of data for commanders.
Is linked to civilian occupational analysis databases.	To facilitate outplacement.
Is automated and on-line.	To facilitate updating the system rapidly. To enhance accessibility to users.
Is coupled with a top-down, future-oriented, job analysis procedure.	To facilitate manpower planning.

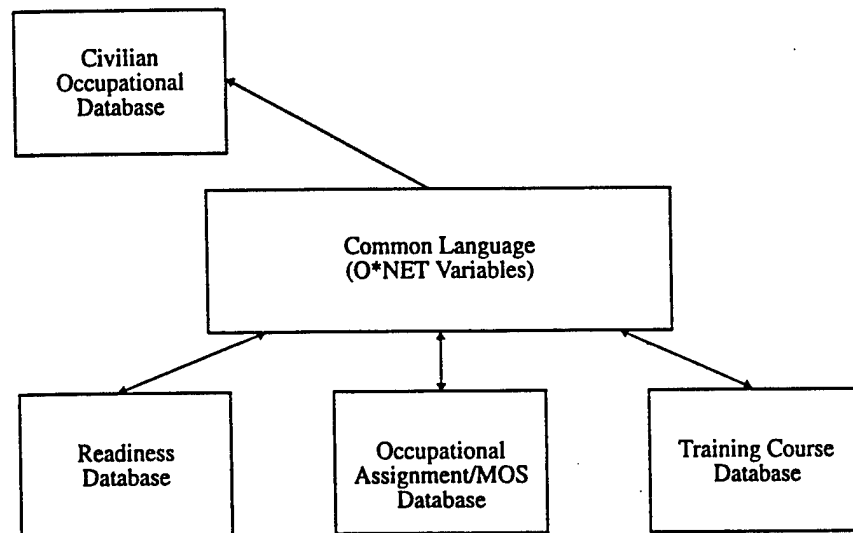


Figure 1. Three Linked Databases

Linked Databases

The Army will need three kinds of databases to fully realize the potential MPT applications—an occupational database, a readiness database, and a training course database. As shown in Figure 1, all three databases would be related to each other in terms of a common language (e.g., the O*NET variables).

The readiness database would include information about the readiness of individuals that could be aggregated to assess the readiness of a unit. It would contain individuals' test scores, supervisor ratings, ratings of proficiency to perform various missions, functions, and

tasks, and training and experience records organized according to the common language. Where relevant, personnel records would be incorporated into the readiness database.

The occupational assignment/MOS database would contain ratings of the importance of various activities and knowledge and skill level requirements for each MOS, assignment, function, or mission. The training course database would indicate the degree to which each training course teaches a particular knowledge, skill, ability, or work activity.

How would these databases be used? Consider the example scenario

COL Asbury needs to assemble a special operations team for a mission in Saudi Arabia. The mission will involve training a small cadre of Saudi officers in mission planning for direct action missions. For this mission he needs U.S. Army officers who speak Arabic, are excellent mission planners, have experience on direct action missions, are highly knowledgeable about air-land battle, and are good teachers and diplomats.

In the ideal system, COL Asbury would access the on-line Army Personnel Network (AP*NET) and indicate the type and level of skills and abilities needed for the mission. The system would search the readiness database, looking for individual's whose skills and abilities match the mission requirements.

Consider another example

The 99Q MOS is being combined with the 99C and 99D MOS. Mr. Alcott needs to determine the training requirements for this merger.

Mr. Alcott would probably first want to know how similar the MOS are. He would access the AP*NET occupational analysis database which would indicate the similarities and differences across the MOS. In turn, he could search the training database for courses that provide training in particular skills, and he could also search for civilian sector training courses likely to develop those skills.

Security

The ideal occupational analysis system would not only fill traditional MPT needs in support of readiness, but it could also become part of the battle. Occupational analysis data could be used by our own commanders to make decisions about assignments. It could also be a target for enemy sabotage or reconnaissance attempts. The important point here is that occupational information could be used much differently in the future if it were accessible and included descriptors that were useful to military commanders. Guidance on access to the system would need to be considered carefully.

Digitization

The Army's ideal occupational analysis system would provide data that could be useful to commanders in planning and conducting missions. Let's push the limits of how occupational analysis might be used in 2010.

LT COL MCCALL has been tasked to perform a direct action mission in an Arabic country. As he is leaving, he downloads his battle book onto his arm-band digital computer (see Figure 2)

During the mission, LT COL MCCALL can access information at several levels of aggregation (individual, squad, platoon, company). He can determine the current status of his troops through satellite linkages to them, determine which units to move to particular locations based on immediate needs, update plans, identify a demolitions expert to remove an obstacle, find an Arabic speaker to interrogate a prisoner, and issue orders.

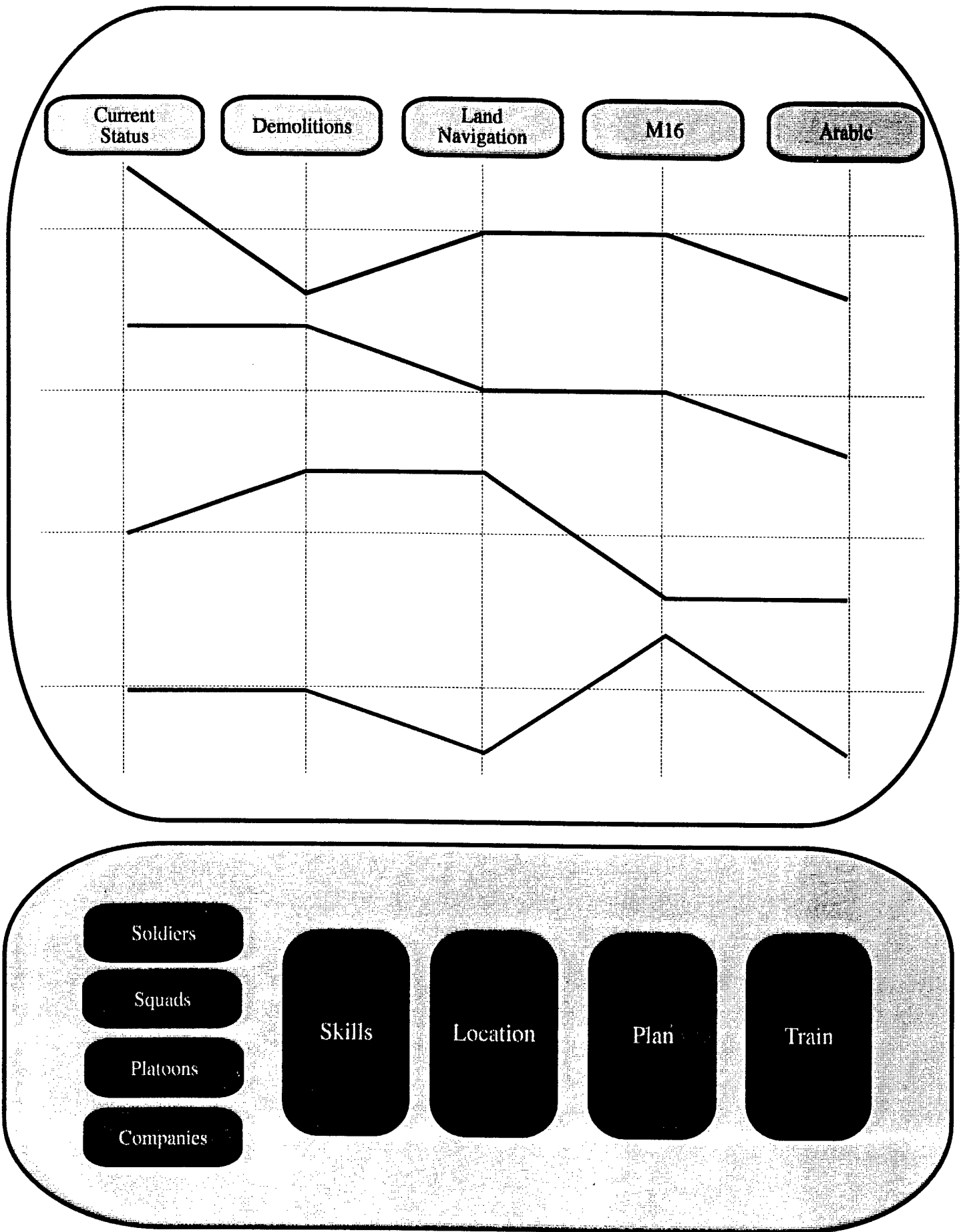


Figure 2. Digitized Battle Book Display

IV. O*NET

For the last seventy years, the *Dictionary of Occupational Titles* has been the principal tool for describing occupational requirements. It provides narrative descriptions of tasks, tools, duties, and working conditions for about 12,000 distinct jobs. These narratives have been used as an aid in job placement, career counseling, and establishing training and educational requirements.

The *DOT's* job-specific orientation has, however, limited its usefulness. The focus on requirements for each specific job made it virtually impossible to make cross-job comparisons. Developing and maintaining specific information for so many jobs was a formidable task, and job descriptions became outdated. Moreover, the Department of Labor (DOL) faced many of the same occupational analysis issues that concern the Army such as the need to provide accurate information to users in a timely fashion and to provide information that will be useful to a variety of users (Crosby & Faber, 1994; Worstine, 1995).

DOL began development of a new type of occupational information system. This system, referred to as the O*NET, is intended to provide a general framework for describing jobs and the characteristics people need to perform those jobs. The envisioned system is to be applicable across a range of jobs and levels of aggregation (positions, jobs, job families, and the work force as a whole), providing a seamless, integrated descriptive system in a common language capable of serving the needs of a variety of users. Some of the intended applications of O*NET include placing workers, counseling workers, identifying training and educational requirements, promoting cross-training, creating job families, monitoring work force trends, and making personnel projections.

The Content Model

At first glance, it may seem impossible to envision an occupational information system capable of serving the needs of so many users. The content model developed for the O*NET appears to be a workable solution to this problem (AIR, in preparation). It is based on three key postulates:

- (1) Jobs can be described quantitatively in terms of variables that generalize across jobs. For example, jobs might be described in terms of inductive reasoning requirements. The content model is designed to be a general, reasonably stable descriptive system.
- (2) Multiple windows can be used to observe the world of work. Each window reflects a set of descriptors associated with an application. For example, skills and knowledges are of interest when one is concerned with training, while abilities are more likely to be used in selection and placement. Multiple windows allow the system to address multiple applications.
- (3) Within a given domain of descriptors, variables can be organized hierarchically (see Figure 3). Hierarchical arrangement of descriptors (a) allows users to access multiple levels of specificity and (b) provides a way to organize job-specific descriptors, such as tasks, within a more general cross-job structure.

The content model covers six domains:

- Worker characteristics, e.g., abilities, interests
- Worker requirements, e.g., basic skills
- Experience requirements, e.g., training, experience
- Occupational requirements, e.g., generalized work activities
- Occupation-specific requirements, e.g., tasks
- Occupation characteristics, e.g., wages, labor market

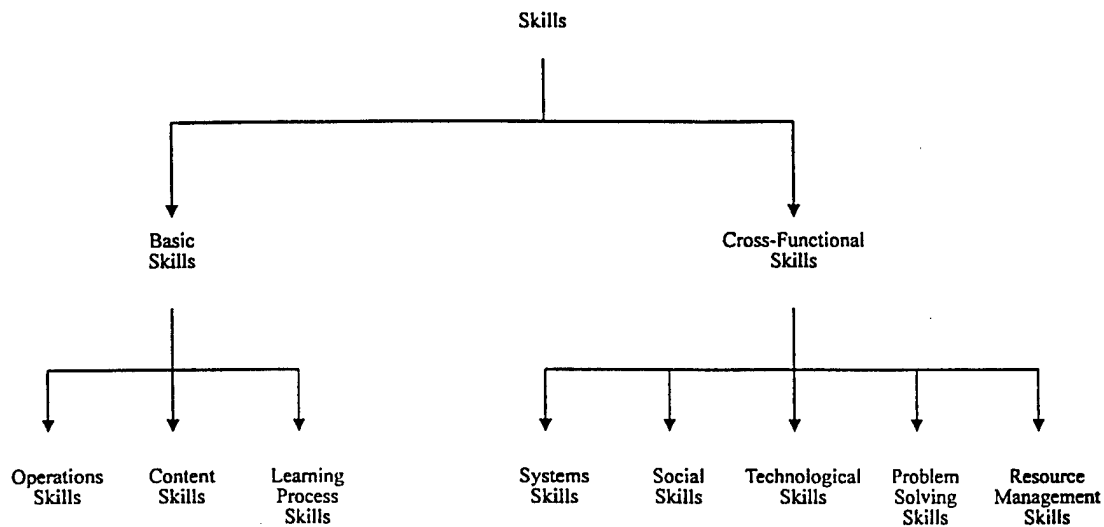


Figure 3. Hierarchical Arrangement of Skills

Broadly speaking, the content model assumes that jobs can be described either in terms of the work being done (occupational descriptors) or the demands placed on the people doing the work (worker-oriented descriptors). As depicted in Figure 4, workers bring to the job certain characteristics, worker characteristics such as abilities and interests, and as a function of their experiences develop certain capacities, that help them do their job. These worker requirements include the skills and knowledge people must acquire to do the work. The work people do, occupational requirements, is described by generalized work activities, for example operating heavy equipment. These work activities, however, are influenced by requirements imposed by the job environment, or work context, as well as requirements imposed by the organizational structure, or organizational content. All of these variables, in turn, are influenced by the organization and its operating environment (e.g., industry type, labor market).

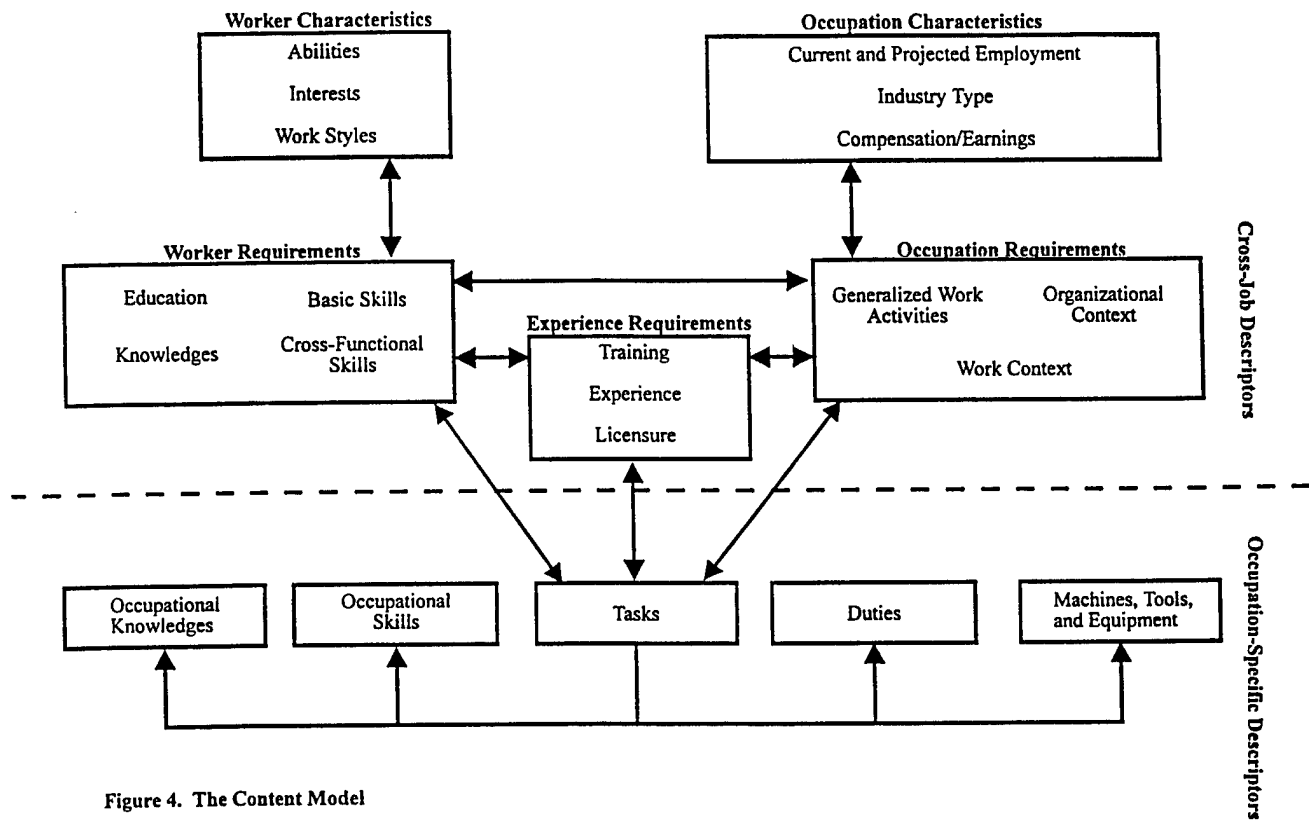


Figure 4. The Content Model

Initial development of the content model variables focused on descriptors that were not occupation-specific. The descriptors in each domain emerged from literature reviews. Based on those reviews, rating scales were developed to measure certain characteristics of the descriptors (see Figure 5). For example, generalized work activities were to be described in terms of importance and frequency while skills were to be described in terms of level, importance, and when they were acquired.

Worker Characteristics

Worker characteristics reflect relatively enduring characteristics of the individual that might influence job performance. Worker characteristics include: (1) abilities, (2) interests, and (3) work styles. The abilities constructs were predominantly drawn from Fleishman's ability requirements taxonomy. The variables included in this domain include basic cognitive, psychomotor, physical, and perceptual abilities virtually all of which are known to have direct relevance to Army jobs, particularly in the selection and assessment arenas.

Interests and work styles are also clearly relevant to selection and placement. In the O*NET interests are assessed in terms of occupational values. Work styles, on the other hand, refer to non-cognitive stylistic characteristics such as achievement orientation, independence, and adaptability. These work style variables represent personality characteristics that are relevant to either job performance or the development of requisite knowledges and skills.

Work style variables included in the O*NET are relevant to performance on military as well as civilian jobs. Adaptability, independence, and achievement motivation may, in fact, be essential characteristics of soldiers in the future. The interest measures also are clearly relevant to Army jobs. For example, autonomy and altruism are values which are as relevant to military as to civilian occupations. Nonetheless, it should be recognized that this kind of broad value structure may fail to capture certain key values that distinguish different military career fields. Thus, if the O*NET is to be applied in the military setting it may be necessary to extend this conceptual structure to capture key values operating within the military environment.

17. Problem Identification

Identifying the nature of problems.

Level

What level of this skill is needed to perform this job?

HIGH

LOW

⑦

⑥

⑤

④

③

②

①

NR

← Analyzing corporate finances to develop a restructuring plan.

← Identifying and resolving customer complaints.

← Comparing invoices of incoming articles to ensure they meet required specifications.

Not relevant at all for performance on this job

Importance

How important is this skill to performance on this job?

Not Important

Somewhat Important

Important

Very Important

Extremely Important

①

②

③

④

⑤

Job Entry Requirement

Is this level of skill required for entry to this job?

① YES, it is required for entry on the job.

② NO, it can be learned on the job.

Figure 5. Example Skill Rating Scale

Worker Requirements

Worker requirements are skills and knowledges that people develop as a function of experience and education. These skills and knowledges are thought to be transferable across jobs and thus should play a progressively more important role as organizations seek to develop a work force capable of adapting to new types of job demands.

Skills are organized into six broad categories likely to be involved in virtually all jobs:

- (1) Basic skills, such as reading and listening as well as learning to learn skills such as critical thinking and active learning,
- (2) Problem solving skills such as problem identification and information organization,
- (3) Social skills such as persuasion and coordination,
- (4) Technological skills such as design and trouble shooting,
- (5) Systems skills such as identification of downstream consequences and objective evaluation, and
- (6) Resource management skills such as time management and management of material resources.

In contrast to skills, knowledges examine the kind of concepts that provide a basis for performance. Accordingly, knowledges were identified by determining basic types of concepts likely to be applied in a variety of different jobs. Thus basic concepts involved in electronics, psychology, and transportation were considered among other areas. In all some 33 broad knowledge areas were identified with each area subsuming a number of more specific concepts. Thus biology might subsume cellular biology, ecology, genetics, and biochemistry.

Both the knowledges and the skills might be directly applied in describing jobs in the military. In fact, because these knowledges and skills capture basic, transferable capabilities, they may represent an essential component of any personnel system intended to prepare people for the dynamic jobs of the future. However, it may prove necessary within the

Army content, to extend the military/public safety domain to identify certain key types of knowledge (e.g., armor tactics) essential to Army combat missions.

Experience Requirements

The term, experience requirements, refers to training and career history events that influence knowledge and skill development. Although the training, licensure, and education component of the O*NET currently focuses on relevant developmental experiences in the private sector, this area could easily be extended to capture key developmental experiences in the Army such as ranger training, exposure to any performance in relevant training courses, etc.

Occupation Requirements

The preceding sections have focused primarily on attributes of the people doing the work. The O*NET content model, however, also examines attributes of the work itself and the conditions under which this work occurs. Three major areas are included under occupational requirements - generalized work activities, work context, and organizational context.

Traditionally, the work done on jobs is described in terms of tasks. However, tasks are highly specific descriptors that do not readily allow comparisons across jobs. Therefore, O*NET contains generalized work activities--broad types of job activities that occur to different degrees in a number of occupations. These generalized work activities were identified through earlier factorings of task inventories and included dimensions such as administration and operating heavy equipment. In all, 42 generalized work activities are included in the O*NET, all of which have direct relevance to the kind of tasks and duties performed in the Army. However, it may be necessary to extend this initial set of generalized work activities to capture certain kinds of activities that may be unique to military settings such as operating weapons systems or conducting peacekeeping missions. Task dimensions developed in the Army's synthetic validation project provide an extremely valuable resource in this regard (Hoffman, Fotouhi, & Campshure, 1991; Peterson, Owens-Kurtz, & Rosse, 1991).

Work context variables describe the conditions under which job activities must be carried out. They include physical conditions (e.g., temperature and noise) as well as social psychological conditions (e.g., time pressure and dependence on others) that might influence how people go about performing certain activities. Again, virtually all of the work context variables being assessed in the O*NET effort are relevant to the kinds of activities occurring in Army jobs. However, it may be necessary to add some military specific context variables to provide a more complete description. For example, although exposure to chemicals and radiation risks occurs on military and civilian jobs, exposure to artillery and aircraft shelling would not be relevant to understanding performance on most civilian jobs. Thus, there may be a need to add in some unique types of environmental variables, specifically certain conditions occurring in combat environments, if the O*NET model is to be applied in describing military occupations.

Organizational context refers to variables that might interact with the operational environment and how people go about doing their work. For example, a flatter, more open organizational structure may require workers who possess a broader range of skills, placing a premium on problem-solving skills and an independent work style. O*NET organizational context variables were identified after a review of studies on high performance organizations. They are intended to be used to assess the impact of organizational structure on how the work gets done.

Many of the organizational context variables that are relevant to high performance in civilian organizations also apply in the military (e.g., teamwork, autonomy). However, the measures of these variables used in the O*NET effort are more appropriate for civilian than military organizations. Accordingly, substantial revisions in the organizational content variables may be required for Army applications. However, it is important to note that the organizational context domain is the most experimental aspect of O*NET. Its usefulness for selection and training is unclear. Thus the Army might choose to ignore this part of the model in the short run while additional research evidence accumulates.

Occupational Characteristics

Occupational characteristics refer to economic conditions that shape the nature of the organization, its market, and employment conditions. For the most part, no attempt has been made to obtain measures of these variables in O*NET. Instead, measures of these variables are drawn by accessing databases such as those maintained by the Bureau of Labor Statistics. Many, but not all, of these variables such as compensation and employment projections will be of interest to the Army in a future if there is more integration of the military and civilian sectors. The Army should consider supplementing this section with its own market analysis indicating where various types of jobs are (geographically) and other relevant factors such as additional pay for dangerous duty or regular overseas travel requirements.

Occupation Specific Requirements

Occupation specific descriptors such as tasks, duties, machines, tools, and so on cannot be derived from literature reviews; they require input from job holders and their supervisors. In the O*NET system occupation-specific descriptors are being generated for occupations and organized in terms of the broader cross-job structure. So far, research suggests that identification of job-specific descriptors is greatly facilitated by the availability of a broader, cross-job organizing structure. Further, it appears that by organizing the specific descriptors in terms of a broader, common language it becomes possible to apply job-specific information more efficiently. For example, it is easier to use task data in describing jobs when those data have been organized in terms of generalized work activities.

Database

Taken as a whole, it appears that the O*NET system, particularly the cross-job descriptors, can be extended to the military setting relatively easily. In most cases, this will entail little more than adding certain military specific variables. Further, it appears that this cross-job structure can also be applied in a military setting to organize and identify job specific descriptors. This relatively straightforward transfer is noteworthy primarily because it

suggests that a military occupational database can be developed that can be directly linked to a general civilian database. This capability will, of course, greatly enhance the long-term utility of the 'database' for an environment requiring closer integration of military and civilian occupations (e.g., outplacement of personnel).

When a database of the type envisioned for O*NET has been developed, it will provide a basis for addressing many questions which represent key concerns in force development. For example, a database describing the characteristics of jobs in terms of the O*NET variables might be used to establish the relationship between skills and generalized work activities. Alternatively, if individuals have been assessed in terms of the skills, knowledges, and career experiences specified by the O*NET model, this information might be used to identify those individuals who are particularly well qualified to assume a role on a team requiring performing certain types of activities.

Those examples illustrate an important characteristic of the O*NET approach. The O*NET model, by describing jobs in terms of more general, cross-job variables, makes it possible to develop a database specifying how different types of descriptors, skills and generalized work activities, for example, are related to each other in terms of job description dimensions (e.g., correlations based on ratings of importance for successful job performance). When linked to databases containing information about persons on those same variables, this characteristic of the O*NET structure makes it possible to integrate multiple characteristics of people and jobs. The resulting structure, in turn, makes it possible to integrate multiple personnel functions and search for answers to fundamental questions in workforce management in a timely, cost-effective fashion.

V. The Army Personnel Network (AP*NET)

A system like the O*NET occupational descriptive system would clearly contribute to Army operations in the twenty-first century. It would support force development efforts ranging from the description of jobs and the allocation of training resources to mission assignments and manpower forecasting. The question that arises at this juncture, however, is how the Army might develop the Army Personnel Network (AP*NET).

The AP*NET Concept

AP*NET could be composed of three databases linked to each other by a common set of descriptors:

- an occupational database--jobs/functions/missions rated quantitatively on descriptors,
- a readiness database--individuals' scores on knowledge, skill, and ability measures for each descriptor, and
- a training curriculum database--quantitative ratings of training courses on descriptors.

As shown in Table 3, O*NET will be able to fill many, but not all of the desirable characteristics for AP*NET. Some Army-specific variables will need to be added, particularly to the general work activities and cross-job skills and knowledges.

Table 3.

Mapping of Desirable AP*NET Characteristics Against O*NET Characteristics

Desirable AP*NET Characteristic	O*NET Characteristic
Uses a common language.	Uses a common language developed through extensive literature reviews and analyses.
Includes descriptors for a wide range of person attributes (e.g., interpersonal, problem solving).	Includes a comprehensive set of personal characteristic descriptors.
Includes descriptors for general work activities, skills, and knowledges that are relevant across jobs.	Includes cross-job descriptors that would need to be supplemented with Army-specific cross-job descriptors.
Includes occupation-specific descriptors (e.g., specific tasks, equipment and technology).	Includes a process for gathering occupation-specific descriptors. Does not include task, equipment, or technology descriptors.
Includes descriptors at varying levels of specificity arranged hierarchically.	Includes hierarchically organized descriptors.
Includes a taxonomy of missions and linkages among missions, work activities, skills, and knowledges.	Does not include Army-specific variables.
Includes variables or aggregates of variables likely to be useful to commanders.	Does not include Army-specific variables.
Is linked to civilian occupational analysis databases.	Is linked to the Bureau of Labor Statistics databases.
Is automated and on-line	Is planned to be automated and on-line.
Is coupled with a top-down future-oriented job analysis procedure.	Does not include a built-in future-oriented job analysis approach.

One important difference between O*NET and AP*NET is that AP*NET's common language will need to include a taxonomy of missions. The taxonomy would link tasks and perhaps skills and knowledges to missions. Each database could be examined according to the mission-related variables. For example, the readiness database would contain information about individual's skills and abilities relevant to various missions, and the training database could be examined to find courses that train skills and abilities relevant to each mission.

O*NET is under development; it may evolve to some degree in the near future. O*NET and AP*NET efforts should be closely coordinated to ensure seamless integration across the two. To maintain comparability with the O*NET database, new AP*NET variables should *supplement* rather than *replace* O*NET descriptors. Also, the Army should benefit from lessons learned and knowledge gained in O*NET development to save time and money.

AP*NET Development Steps

The bulk of AP*NET development requirements can be accomplished in two phases shown in Figure 6:

- | | |
|----------|-------------------------------|
| Phase I | Develop prototype AP*NET, and |
| Phase II | Pilot test and expand AP*NET. |

Phase I, Develop prototype AP*NET, could be accomplished fairly rapidly (about 12 to 18 months) and at a relatively low cost by making use of O*NET and previous Army research. The prototype would include: (a) a pilot test version of the occupational analysis database, (b) a plan for the readiness database, and (c) a plan for the training course database. Phase I would include five primary tasks:

- | | |
|---------|--|
| Task 1. | Develop an Army (or military) version of the content model. |
| Task 2. | Conduct a small sample tryout. |
| Task 3. | Prepare the pilot test version of the occupational database. |
| Task 4. | Prepare a plan for the readiness database. |
| Task 5. | Prepare a plan for the training curriculum database. |

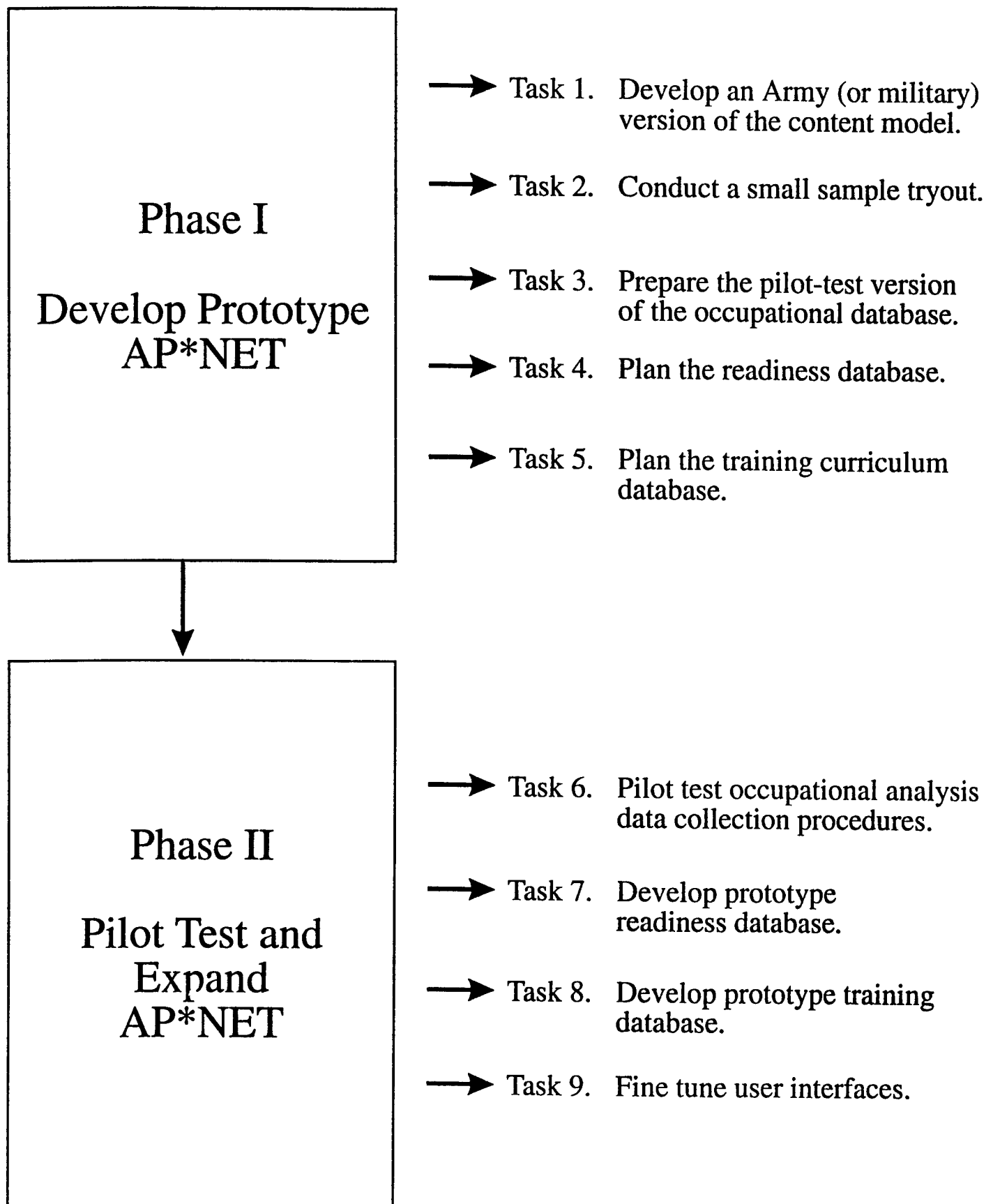


Figure 6. AP*NET Developmental Steps

After developing the AP*NET prototype, the Army could pilot test AP*NET and begin its expansion to all Army jobs. Several Phase II tasks can be anticipated:

- | | |
|---------|--|
| Task 6. | Pilot test the occupational analysis data collection procedures. |
| Task 7. | Develop a prototype readiness database. |
| Task 8. | Develop a prototype training database. |
| Task 9. | Fine tune user interfaces. |

Workplan

Task 1. Develop an Army (or military) version of the content model.

1.1. Supplement **cross-job** descriptors in the O*NET with Army-specific cross-job descriptors. Specifically, for the five cross-job domains in the O*NET:

- Worker characteristics--We anticipate very little change, but O*NET's worker characteristics should be reviewed systematically against those identified in Army efforts.
- Worker requirements--Add cross-job Army-specific knowledges and skills; start by reviewing training and ROTC course curricula.
- Experience requirements--This section will need to list Army training courses and qualifications (e.g., language training, airborne qualified, etc.)
- Occupation requirements--Supplement the generalized work activities with general work activities identified in the Army's synthetic validation project. Add variables pertaining to combat environments to the work context variables. We recommend ignoring the organizational context variables in the short run.
- Occupation characteristics--The Army should consider supplementing this section with its own market analysis indicating where various types of jobs are

(geographically) and other relevant factors such as additional pay for hazardous duty or regular overseas travel requirements.

1.2. Develop procedures for obtaining and coding **job-specific** information:

- Develop procedures for coding or organizing existing task descriptions in terms of the O*NET system.
- Develop procedures for collecting job-specific information within the O*NET framework. These procedures should stress the deductive rather than inductive identification of job tasks.
- Identify a taxonomy of Army missions and develop a procedure for identifying the knowledges, skills, abilities, and so on needed for different types of missions.

Task 2. Conduct a small sample tryout

- 2.1 Identify three jobs to include in a small sample tryout. These might be ones that the Army is already collecting data on for the ODARs system.
- 2.2 Collect data from a small sample of individuals in each job.

Task 3. Prepare the pilot test version of the occupational database

- 3.1 Analyze data from the small sample tryout.
- 3.2 Develop beta test versions of the user interface.

Task 4. Prepare a plan for the readiness database

- 4.1 Map current selection and assessment measures (e.g., the Armed Services Vocational Aptitude Battery) and database (e.g., Enlisted Master File) variables onto the O*NET

variables to identify the person characteristics and person requirements measures for which existing data are available.

4.2 Identify variables for which data are not available.

Task 5. Prepare a plan for the training curriculum database

- 5.1 Develop procedures for mapping current training programs onto the O*NET knowledges and skills. This analysis of training program content should be used to identify the knowledges and skills needed on different jobs as well as transferable knowledges and skills. It should be done in conjunction with the development of worker requirements in Task 1. Oppler, Felker, and Rossmeissl (in review) recently completed a project along these line for DMDC that would be useful for this task.
- 5.2 Apply the procedures for a small sample of courses.

Task 6. Pilot test the occupational analysis data collection procedures

- 6.1 Select a sample of jobs.
- 6.2 Collect data.
- 6.3 Analyze data.

Task 7. Develop a prototype readiness database

- 7.1 Identify measures to fill gaps and deficiencies in the assessment process, for example, problem solving and social skills.
- 7.2 Develop a method for collecting personnel data.
- 7.3 Conduct a small sample tryout.

Task 8. Develop a prototype training database

- 8.1 Select a sample of training courses.
- 8.2 Code courses into database.

Task 9. Fine tune user interfaces

- 9.1 Identify users for five key system applications (e.g., training development and evaluation, manpower planning, mission assignments).
- 9.2 Conduct focus groups allowing users to try out the system using prototype databases.
- 9.3 Revise user interfaces based on user comments.

Other Recommendations

Some other recommendations for future efforts include:

- Procedures should be developed for assigning individuals to teams which optimize multiple concerns including availability, mission performance requirements, and force development needs.
- Studies should be initiated concerning the work requirements of new missions and used to identify team performance requirements.
- Career development programs, training, job classifications, and experience requirements should be measured and related to performance on different types of assignments.
- Information systems should be developed that allow leaders to project outcomes based on force capabilities and changes in force capabilities.

Clearly, many of the recommendations represent a long-term progressive effort. Further, they will, in many cases, require the development of new technologies ranging from new assessment systems to mission planning models which explicitly incorporate the availability and capability of personnel. Although these kinds of efforts represent a daunting challenge, systematic efforts along these lines may do much to help ensure a force capable of dealing with a complex new world while providing a basis for integrating workforce capabilities into mission planning.

AP*NET Application Windows

When complete, AP*NET could provide a valuable resource for many MPT applications including:

- Manpower Planning,
- Mission Staffing,
- Course Development and Evaluation,
- Recruiting,
- Placement/Classification,
- Relocation/Transfer, and
- Outplacement.

How can AP*NET serve so many users? Two concepts that facilitate use are, of course, use of a common language across jobs and databases, and use of variables organized hierarchically. A third important concept is use of multiple application windows as shown in Figure 7. Each window reflects a set of descriptors associated with an application. For example, skills and knowledges are relevant to training applications, while abilities are more likely to be used in selection and placement. Multiple windows allow the system to address multiple applications.

For example, consider the course evaluation scenario

Mr. Tkachenko wants to know whether his school is providing trainees with the skills they need to perform their jobs.

Mr. Tkachenko would access AP*NET's course evaluation application window. He might first ask, does my training address skills required by MOS? AP*NET would access the training curriculum database and the occupational analysis database and compare descriptions of the skills trained in the courses against those needed by particular MOS. That step would highlight training deficiencies based on job analysis expectations.

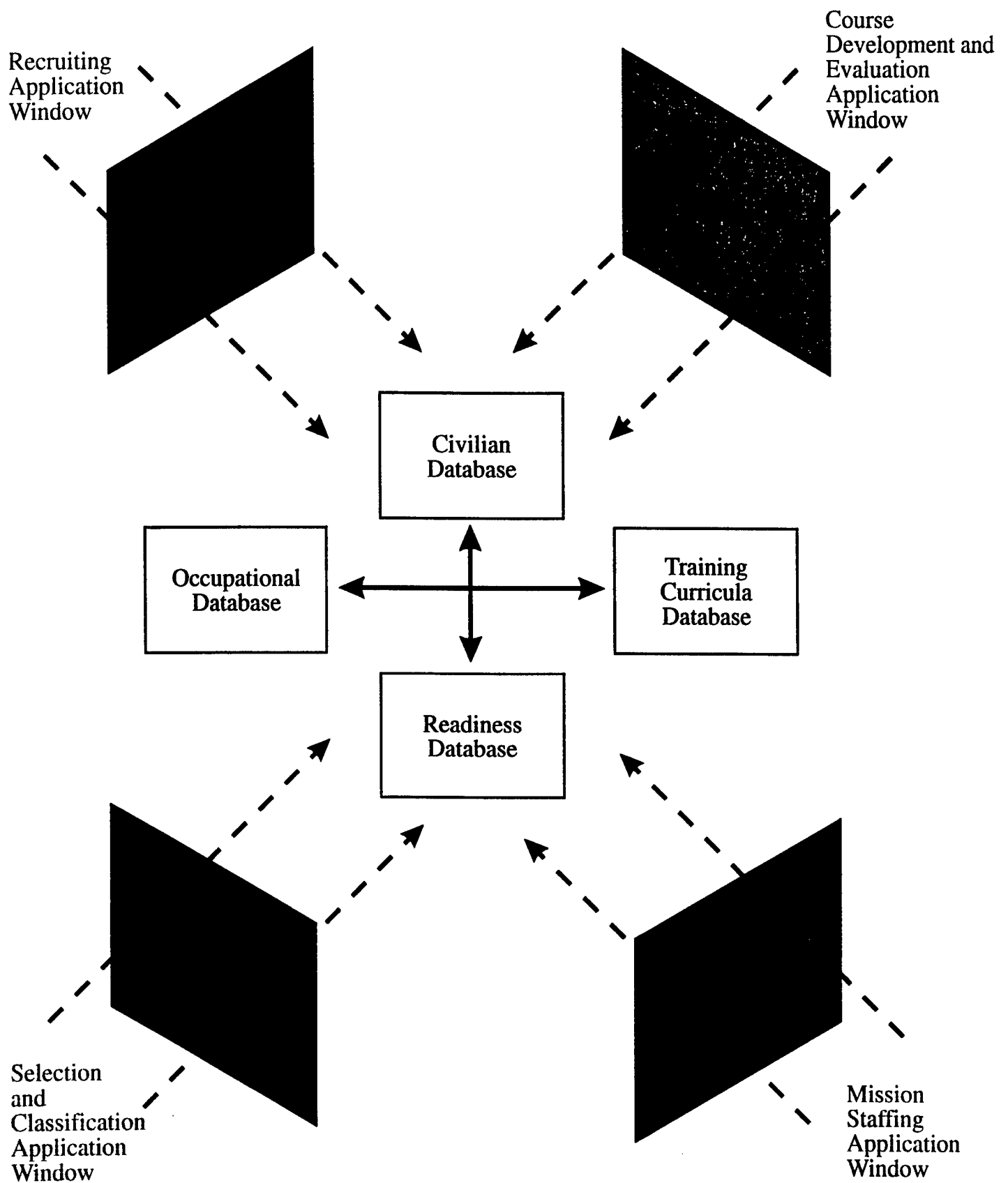


Figure 7. Example AP*NET Application Windows

Trainers will also want to know whether there are skill deficiencies in the field that training should address. In a second step, the application would access the readiness database and the occupational analysis database. It would compare the average level of skill of individuals in those MOS against the job requirements in the occupational database. That analysis would show where training could address gaps in skills in the field.

Or, consider the relocation scenario

A warrant officer, Keesha Gray, is an excellent rotary wing aircraft pilot. Unfortunately, her mother in Chicago is very ill, and there are no other family members to take care of her. Ms. Gray will need to take a hardship discharge if she cannot take an Army job that moves her to the Chicago area.

Keesha could go to an Army Career Center (perhaps in the local library) and access AP*NET. She could pull up the transfer/relocation window and ask the system to identify jobs she is likely to qualify for in the midwest. The transfer/relocation window would need to access two databases--the readiness database to obtain Keesha's record and the occupation database to match Keesha's record with jobs. It would then need to select only jobs available in the midwest by tapping into the Army's labor market information. After obtaining a list of jobs that she is likely to qualify for, Keesha could enter a qualifications window to obtain a specific list of the duties, responsibilities, and qualifications for each job.

Suppose Keesha finds a rotary-wing instructor job that she could qualify for, but she lacks training in instructional methods. She could access the training application window to obtain a list of military and civilian courses that could fill that need.

AP*NET Summary

AP*NET is envisioned as three linked databases describing jobs, people, and training. If realized, AP*NET could even be used beyond typical MPT applications in organizing units for operations.

AP*NET would serve multiple user needs by describing jobs, people, and training in a common language. It would contain variables organized hierarchically such that users could access the level of information best suited to their purposes, and application windows would simplify its use.

Clearly, AP*NET development is a far reaching task. But, a prototype version of AP*NET could be developed fairly quickly by supplementing the O*NET variables with information from Army studies.

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